objections raised by parents could be overcome by providing clear and consistent professional advice and by emphasising that primary immunisation with measles vaccine or measles, mumps, and rubella vaccine does not confer immunity on all recipients. Diagnosis of measles is unreliable, and doctors have a responsibility for improving diagnostic accuracy.[26] Furthermore, achieving high coverage also requires strenuous efforts in following up those who fail to respond to offers of immunisation; such efforts will also need to include being flexible about when immunisation can be performed.

Our campaign shows many of the problems likely to be encountered by national immunisation campaigns based on schools. The lessons learnt apply to similar campaigns that may be contemplated by other developed countries in their drive to eliminate measles by 2000.

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Serum cholesterol concentrations in parasuicide

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Abstract

***Objective*—To evaluate whether people who have committed parasuicide have low serum cholesterol concentratrions.**

***Design*—Results of blood tests in subjects admitted to hospital for parasuicide compared with those of a control group of non-suicidal subjects; comparison in subgroup of parasuicide subjects of two sets of blood test results (one set from admission for parasuicide and the other from admission for some other illness).**

***Setting*—General hospital, Ferrara, Italy.**

***Subjects*—331 parasuicide subjects aged 44 (SD 21) years (109 with two sets of blood test results) and 331 controls.**

***Main outcome measures*—Serum cholesterol concentrations and possible association with parasuicide, considering sex, violence of method of parasuicide, and underlying psychiatric disorder.**

***Results*—Lower serum cholesterol concentrations (4·96 (SD 1·16) mmol/l) were found in the parasuicide subjects than in the controls (5·43 (1·30); $P<0·001$), regardless of sex and degree of violence of parasuicide method. Both men and women with two sets of blood test results had lower cholesterol concentrations after parsuicide. Linear regression analysis showed that the difference in cholesterol concentrations was significantly related to the length of time between the taking of the two sets of blood samples.**

***Conclusion*—The study showed low cholesterol concentrations after parasuicide. This finding agrees with previous studies, which suggest an association between low cholesterol concentration and suicide.**

Introduction

Recent reappraisals of data from cardiovascular primary prevention trials aimed at reducing serum cholesterol concentrations showed that despite the reduction in deaths from cardiovascular causes the total mortality had not significantly decreased,[1] owing to a higher mortality from violent deaths and suicide.[2] Meta-analysis confirmed an increased mortality from accidents and violence (suicide and homicide),[3] and low concentrations of cholesterol were prospectively associated with an increase in the risk of violent death or suicide.[2,4,5] Moreover, a negative correlation between cholesterol concentration and mortality from injuries, especially for suicide, was reported.

An association between low serum cholesterol concentrations and depressive symptoms has been found in elderly men,[7] while low serum cholesterol concentrations have been reported in people with violent or aggressive behaviour.[8,9] The association between low

cholesterol concentrations and violent death, however, is still debated.[10-13] A Finnish study on the relation between cholesterol concentration and mortality from injuries was inconclusive,[14] and analysis of data from the Edinburgh artery study showed that serum cholesterol concentrations in men were not significantly associated with aggression.[15] Other investigators did not find any association between low cholesterol concentration and either risk of accidental death[16] or the presence of severe depressive symptoms in elderly people.[17]

It is not clear from the studies reporting a positive finding whether suicidal behaviour was linked to lowered cholesterol concentrations or to a change in the subjects' normal cholesterol concentrations or whether it was a side effect of dieting or drug treatment. Biological mechanisms linking low serum cholesterol concentration and suicidal behaviour were hypothesised.[18]

We studied data from a group of subjects followed up after suicidal behaviour to focus on the hypothesis that suicidal behaviour might be linked with low serum cholesterol levels.

Subjects and methods

All residents in the district of Ferrara (which has about 140 000 inhabitants) who showed suicidal behaviour (parasuicide) during 1 January 1988 to 31 December 1992 were included in the monitoring register for parasuicide in the World Health Organisation's European multicentre parasuicide study[19] and were recruited for this study. All attended the general hospital, Ferrara. Medical information was drawn from hospital records for all admitted subjects.

Parasuicide is an "act of a non-fatal outcome in which an individual deliberately initiates a non-habitual behaviour that, without interventions from others, will cause self-harm, or deliberately ingests a substance in excess of the prescribed or generally recognised dosage, and which is aimed at realising changes that the persons desire via the actual or expected physical consequences."[19] Individuals with alcohol poisoning alone are not considered to have committed parasuicide.

In all, 641 cases of parasuicide were seen during the study period. Only episodes in which the individuals were admitted to hospital were included. As 184 minor episodes did not result in admission our sample constituted a consecutive, unselected series of 457 episodes of parasuicide (338 in women, 119 in men) in 396 different subjects (285 women, 111 men). As acute illnesses, surgery, and trauma may lead to a drop in cholesterol concentration[20,21] we considered only the test results of blood samples collected within 24 hours of admission (392 cases (331 different subjects)). In the 65 cases whose blood test results were not considered, 27 blood samples were not taken because of death (4), early self discharge against medical advice (17), and blood transfusion (6), and 38 were taken more than 24 hours after admission.

In the 331 subjects in whom blood samples were taken within 24 hours of admission, only those samples collected at the time of the first parasuicide were considered. In addition, we investigated the possible conditions for alcoholism (weekly consumption of alcohol >400 g for men, 280 g for women), misuse of drugs (daily misuse of opioids, psychotropic drugs, cannabis, cocaine, and hallucinogens), diabetes, and hypertension (systolic blood pressure >150 mm Hg or diastolic blood pressure >90 mm Hg, or both).

SUBGROUP ANALYSIS

For 109 of the 331 subjects included in the analysis medical information was available that related to a different hospital admission (for some reason other than parasuicide) during the 24 months before (n=78) or the 24 months after (n=31) the admission for parasuicide. Thus for these 109 subjects two sets of data on blood tests were available.

We recruited 331 non-suicidal controls from a group of 2000 non-suicidal subjects whose blood was being tested in the general hospital outpatient laboratory. Each parasuicide subject was matched with a control for age, sex, diabetes, arterial hypertension, heterozygote β thalassaemia, misuse of drugs, and alcoholism. All subjects and controls signed a consent form permitting use of their data for research purposes.

None of the subjects included in the study had used cholesterol lowering drugs before blood sampling. Blood samples were collected in all subjects by venepuncture at 8 am after overnight fasting. Serum cholesterol and triglyceride concentrations were determined by enzymatic methods.[22,23]

CLASSIFICATION OF METHOD OF PARASUICIDE

The method of parasuicide was classified according to the 25 categories in the *International Classification of Diseases*, ninth revision (ICD-9). Each method was then assigned to one of two separate groups on the basis of violence of the method of parasuicide: (*a*) a group of "low violence" methods (X60 to X69) including deliberate self poisoning by ingestion of drugs, alcohol, petroleum derivatives, pesticides, or other chemical products used in agriculture or by inhalation of toxic gases and inhalants; and (*b*) a group of "high violence" methods (X70 to X84) including deliberate self harm by hanging, suffocating, drowning, firearm shooting, use of explosives, fire and flames, cutting, jumping from a high place, and throwing oneself under a moving vehicle.

Data on the psychiatric diagnoses were collected by trained psychiatrists who did not participate in the study. All diagnoses were made after at least two psychiatric interviews and according to standard ICD-9 criteria. For each subject the psychiatric diagnosis was made during the admission for parasuicide. A complete and correct diagnosis was reached for 264 out of the 331 subjects. Six diagnostic groups were therefore identified in these subjects (see box).

Six groups of psychiatric diagnosis identified in subjects (ICD-9 codes)

- Organic mental disorders and psychoactive disorders due to substance misuse (290-294)
- Psychotic disorders (295, 297)
- Affective disorders (296)
- Neurotic disorders (300)
- Personality disorders (301)
- Other psychiatric disorders (302-306)

STATISTICAL ANALYSIS

Statistical analysis was carried out with the STATISTICA program, release 4.5. To compare (*a*) the parasuicide subjects and the matched controls and (*b*) the two test results of blood collected after parasuicide and after a different admission (in the subgroup of 109 subjects) we used Student's *t* test for paired data for red blood cells, haemoglobin, packed cell volume, platelets, cholesterol, creatinine, sodium, potassium, chloride, calcium, and phosphorus. The Mann-Whitney U test was used to compare mean corpuscular volume and aspartate aminotransferase.

To test differences in cholesterol concentration between parasuicide cases and controls with regard to sex, violence of parasuicide method, or psychiatric

diagnosis, a two way analysis of variance with repeated measures on one factor was applied. To investigate the possibility that in the subjects with two sets of blood test results the difference in cholesterol concentration could be related to the length of time between the taking of the two blood samples a linear regression analysis was applied.

Results

Table I summarises the characteristics of the subjects and controls. Table II shows the results of the serum analyses. Data for subsequent parasuicides were available for 46 of the 331 individuals. No difference in cholesterol concentration existed between the subjects who had committed parasuicide more than once (5·04 (SD 1·11) mmol/l) and those who had committed it for the first time (4·96 (1·16) mmol/l; $t=0·498$; P=0·619).

If the sample was divided in turn by sex, violence of parasuicide method, and psychiatric diagnosis the two way analysis of variance always showed a significant difference in cholesterol concentrations after parasuicide compared with the controls; but only the differences for psychiatric diagnosis were significant (table III, table IV).

The test for the least significant difference for multiple comparisons always showed a significant difference in cholesterol concentrations between men and women in the parasuicide subjects but not in the controls.

TABLE I—*Characteristics of parasuicide subjects and controls. Values are numbers (percentages) of subjects and controls unless stated otherwise*

	All parasuicide subjects (n=331)	Controls (n=331)	Parasuicide subjects with two sets of blood test results* (n=109)
Mean (SD) age (years)	44 (21)	44 (20)	50 (20)
Men	93 (28·1)	93 (28·1)	30 (27·5)
Women	238 (71·9)	238 (71·9)	79 (72·5)
Mean (SD) body mass index	32·6 (6·9)	32·8 (6·2)	32·7 (6·8)
Drug misuse**	9 (2·7)	9 (2·7)	4 (3·7)
Diabetes	12 (3·6)	12 (3·6)	7 (6·4)
Hypertension	22 (6·6)	22 (6·6)	13 (11·9)
Alcoholism	21 (6·3)	21 (6·3)	8 (7·3)
Heterozygote β thalassaemia	32 (9·6)	32 (9·6)	10 (10·1)

*At admission for parasuicide and at admission for some other illness.
**In our analysis only misusers of opioids or psychotropic drugs, or both, were found.

With regard to violence of parasuicide method, for the 331 parasuicide subjects significantly lower cholesterol concentrations were found in the group who used high violence methods. The observed difference in cholesterol concentrations was not significant for the subgroup of 109 parasuicide subjects.

For both analyses a significant difference was found between the six different diagnostic groups. The test for the least significant difference for multiple comparisons among diagnostic groups showed that only two of them were responsible for the significance observed. In particular, subjects with either neurotic disorders (ICD-9 code 300) or personality disorders (301) had significantly higher serum cholesterol concentrations than subjects with other psychiatric disorders, regardless of whether they belonged to the parasuicide group or the control group (table III). However, a significant difference between parasuicide subjects and controls was found both in the full group and in the subgroup (109), only for patients with neurotic disorders.

In subjects with two sets of blood test results linear regression analysis showed that the difference in cholesterol concentrations was significantly related to the time interval between the two samples (B=0·0358, SE 0·013, $F=7·77$, P=0·006).

Discussion

The main finding from our study was that lower cholesterol concentrations were present after parasuicide than at other times. This was found both in subjects who had committed parasuicide compared with matched controls and in the subgroup of subjects who had two sets of blood test results (from different hospital admissions). The comparison between the parasuicide subjects and matched controls showed that cholesterol concentrations were lower even when differences were evaluated by dividing the samples into subgroups by sex and by parasuicide method.

PARASUICIDE METHOD AND BLOOD TEST RESULTS

These findings raise the question of whether an interaction exists between degree of violence of parasuicide method and variations in the results of the blood tests. Indeed an interaction between acute diseases and low serum cholesterol concentrations has been reported.[20 21] An opposite trend, characterised by high cholesterol concentrations, was observed during acute psychological stress, maybe due to haemo-

TABLE II—*Mean (SD) values of results of serum analyses in parasuicide subjects and controls*

				Parasuicide subjects with two sets of blood results		
	All parasuicide subjects	Controls	P value	At admission for parasuicide	At admission for other illness	P value
Red blood cell count (10^6 cells/l)	4·58 (0·59)	4·63 (0·57)	0·23	4·58 (0·60)	4·56 (0·51)	0·73
Haemoglobin (g/l)	131·9 (15·89)	141·3 (41·47)	<0·001†	131·8 (17·04)	131·8 (14·60)	0·96
Packed cell volume (fraction of 1·00)	0·40 (0·05)	0·40 (0·04)	0·84	0·40 (0·05)	0·40 (0·04)	0·33
Mean corpuscular volume (fL)	87·74 (7·43)	86·39 (9·24)	0·005‡	88·40 (7·56)	87·98 (8·2)	0·45
White blood cells count* (10^6 cells/l)	8281 (3284)	7570 (2254)	0·001†	8372 (2818)	7665 (2996)	0·025†
Platelets (10^9 cells/l)	277·6 (75·88)	284·0 (75·00)	0·28	276·6 (71·28)	283·9 (68·90)	0·30
Cholesterol (mmol/l)	4·96 (1·16)	5·43 (1·30)	<0·001†	5·03 (1·11)	5·35 (1·07)	<0·001†
Triglycerides* (mmol/l)	1·18 (0·71)	1·13 (0·62)	0·34	1·21 (0·59)	1·28 (0·62)	0·17
Blood, urea, nitrogen* (mmol/l)	10·58 (5·13)	10·50 (3·60)	0·82	11·45 (5·46)	10·87 (4·50)	0·38
Creatinine (μmol/l)	83·40 (20·57)	83·20 (17·90)	0·89	84·48 (22·49)	81·92 (20·17)	0·19
Uric acid* (μmol/l)	284·3 (145·2)	267·0 (101·4)	0·10	303·6 (219·1)	288·5 (85·43)	0·29
Aspartate aminotransferase (U/l)	25·85 (26·33)	26·20 (19·10)	0·89	23·53 (20·34)	30·69 (50·19)	0·07
Alanine aminotransferase* (U/l)	26·75 (29·79)	29·20 (30·10)	0·29	24·30 (20·66)	32·51 (55·14)	0·05
Bilirubin* (μmol/l)	12·67 (6·35)	13·14 (7·80)	0·40	13·13 (7·01)	13·36 (6·82)	0·61
γGlutamyltransferase* (U/l)	29·65 (40·55)	30·70 (37·00)	0·73	34·55 (46·78)	45·98 (109·5)	0·63
Creatine phosphokinase* (U/l)	203·5 (367·3)	147·2 (70·10)	0·006†	166·1 (265·5)	258·8 (425·8)	0·97
Lactate dehydrogenase* (U/l)	264·3 (129·5)	241·1 (114·9)	0·015†	270·9 (123·7)	247·1 (113·4)	0·11
Alkaline phosphatase* (U/l)	115·2 (85·46)	108·3 (58·50)	0·23	127·2 (117·0)	111·9 (64·90)	0·57
Sodium (mmol/l)	140·5 (3·88)	142·1 (2·00)	<0·001†	141·3 (3·05)	141·1 (3·02)	0·55
Potassium (mmol/l)	4·03 (0·44)	4·21 (0·29)	<0·001†	4·06 (0·43)	4·12 (0·34)	0·35
Chloride (mmol/l)	105·5 (4·06)	107·1 (3·20)	<0·001†	106·2 (3·71)	105·4 (3·51)	0·08
Calcium (mmol/l)	1·17 (0·08)	1·20 (0·05)	<0·001†	1·17 (0·07)	1·19 (0·07)	0·22
Phosphorus (mmol/l)	3·70 (0·70)	3·72 (0·56)	0·69	3·69 (0·80)	3·71 (0·60)	0·79
Iron (μmol/l)	15·33 (7·97)	18·04 (6·52)	<0·001†	14·25 (7·48)	16·67 (9·56)	0·023†

*Variables with logarithmic transformation. †Significant according to Student's t test for paired data. ‡Significant according to Mann-Whitney U test.

TABLE III—*Mean (SD) serum cholesterol concentrations in parasuicide subjects and controls by sex, method of parasuicide, and psychiatric diagnosis*

	Total No	Parasuicide subjects	Controls	Parasuicide subjects with two sets of blood test results: Total No	At admission for parasuicide	At admission for other illness
Total	331	4·96 (1·16)	5·43 (1·30)	109	5·03 (1·11)	5·35 (1·07)
Men	93	4·66 (1·12)	5·60 (1·29)	30	4·74 (1·04)	5·17 (0·85)
Women	238	5·08 (1·16)	5·36 (1·29)	79	5·14 (1·13)	5·42 (1·14)
Method of parasuicide:						
Low violence	276	5·02 (1·13)	5·44 (1·31)	86	5·05 (1·13)	5·35 (1·11)
High violence	55	4·67 (1·30)	5·35 (1·23)	23	4·94 (1·07)	5·37 (0·92)
Diagnosis (code) according to ICD-9*						
290-294	16	4·55 (1·16)	4·59 (1·18)	8	4·51 (1·09)	4·86 (0·96)
295-297	23	4·52 (1·05)	5·17 (1·40)	11	4·44 (0·99)	4·76 (0·82)
296	24	4·84 (1·18)	5·19 (0·82)	10	4·56 (0·75)	5·09 (0·98)
300	145	5·12 (1·13)	5·55 (1·32)	42	5·13 (1·01)	5·54 (1·02)
301	29	5·31 (1·28)	5·49 (1·44)	14	5·65 (1·20)	5·75 (1·19)
302-306	27	4·75 (1·38)	5·85 (1·23)	11	4·66 (1·15)	5·09 (0·73)

*Only for subjects in whom complete psychiatric diagnosis could be made.

TABLE IV—*Two way analysis of variance with repeated measures in parasuicide subjects and controls*

Effect	All parasuicide subjects with matched controls (n=331): *F* value	P value	Parasuicide subjects with two sets of blood test results (n=109): *F* value	P value
Difference in cholesterol between parasuicide subjects and controls	36·05	<0·0001	11·75	0·001
Sex	0·67	0·414	2·41	0·123
Difference in cholesterol between parasuicide subjects and controls	19·64	0·0001	10·22	0·002
Method of parasuicide	2·74	0·099	0·04	0·834
Difference in cholesterol between parasuicide subjects and controls	11·27	0·001	9·77	0·002
Psychiatric diagnosis	3·63	0·003	3·14	0·012

concentration.[24] Variations in haematological variables, especially red cell counts and lipid concentrations, have been hypothesised as the cause of interactions.[25] The lower cholesterol concentrations found in parasuicide subjects could be an effect of haemodilution secondary to severe traumas or injuries, owing to a direct correlation between cholesterol concentrations and packed cell volume. Thus lower values for packed cell volume would also be expected. No difference in these values, however, was observed between the groups. Hence the differing cholesterol concentrations in this analysis were not influenced by haemodilution. The variations found in creatine phosphokinase, lactate dehydrogenase, and serum ions between parasuicide and normal subjects could be a consequence of traumatic stress. Thus to rule out a masking effect the trend in blood test results was checked for paired data in an internal control group. This procedure may prevent, at least in part, any confounding effect on cholesterol concentrations due to the "acute stress event." When this internal control group was analysed, only cholesterol and, more weakly, white blood cell count and iron were significant.

The differences in blood ions and cytolytic enzymes between the parasuicide and normal subjects might be explained as being a direct consequence of the self harming behaviour, and it is difficult to relate them to the finding of lower cholesterol concentrations. In the patients with two sets of blood test results, however, lower cholesterol concentration was the only variable with a difference between the control condition and the parasuicide condition. Some underlying disease might have affected both the cholesterol concentration and the other variables in the parasuicide subjects, who vary greatly in terms of causes and conditions. None the less, in subjects with two sets of blood test results the cholesterol concentrations could have a specific meaning in differentiating the parasuicide behaviour from other conditions.

Dietary differences between the groups might have produced bias. If this was so, however, different body mass indexes and serum triglyceride concentrations should have been found for subjects with inadequate or deficient diets—and our results did not show this.

Key messages

- Trials of cholesterol lowering have shown an increased mortality from violent deaths and suicide
- No studies of cholesterol concentrations in parasuicide subjects are available
- This study shows lower cholesterol concentrations in parasuicide subjects than in controls
- The association between low cholesterol concentration and parasuicide, however, does not allow definite conclusions to be drawn
- Further prospective trials are needed to focus on the possible effects of abrupt variation in cholesterol concentration on behaviour

COMPARISON WITH OTHER STUDIES

The nature of the association between low cholesterol concentrations and parasuicide is unknown, and our study does not provide a definite answer. Some of our findings, however, seem to support the hypotheses put forward in previous studies.[2 6] Though seemingly disparate entities, suicide and accidental or violent death have been linked epidemiologically, and it has been postulated that people dying from causes not related to illness may share common dispositional, behavioural, or neurochemical characteristics.[26 27] Moreover, several studies have reported low cholesterol concentrations in subjects with aggressive or autoaggressive conduct disorders,[6 7] thus suggesting a possible association between serum cholesterol concentration, neuronal function, and behavioural predisposition.[8 9] Several studies suggest that low cholesterol concentration could precede depression and consequently enhance the risk of parasuicide.[3 6 7 15 18 27 28] It has been suggested that low serum cholesterol concentration may lead to a rise in suicide risk because serotonin in the brain is decreased.[18] As membrane and plasma cholesterol concentrations are in equilibrium, lower plasma concentrations may contribute to a decrease in serotonin concentrations, which in turn are associated with poor suppression of harmful behavioural impulses.[18] Low cholesterol concentration may increase the speed of serotonin reuptake in the brain, thereby contributing to depression by lowering serotonin.[29] Intracerebrospinal fluid concentrations of 5-hydroxyindoleacetic acid, a serotonin metabolite, have been found to be significantly lower in subjects with impulsive and violent conduct,[30] psychiatric disease, or a history of suicide attempts.[31]

Another important point (not addressed by our study) is whether the high incidence of suicide associated with lowering blood cholesterol concentration is related to the amount of cholesterol reduction.

CONCLUSION

Although a relation may exist between low serum cholesterol concentrations and parasuicidal behaviour, the findings from our study are inconclusive. Thus the question of the long and short term effect of an abrupt variation in cholesterol concentration on behaviour still remains open.

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Strategies for dealing with problems associated with use of services for HIV infection and AIDS out of region: views of providers and users

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Abstract

***Objectives*—To identify reasons why people with HIV infection and AIDS living within the former South West Thames Regional Health Authority use HIV and AIDS services outside the region, and to identify strategies for dealing with the problems associated with such use.**

***Design*—Qualitative study consisting of interviews with individual subjects and focus groups.**

***Setting*—Providers of services for patients with HIV infection and AIDS in South West Thames, central London, and Brighton. Users of such services resident in South West Thames.**

***Subjects*—Thirty four South West Thames residents with HIV infection and AIDS who use or used services outside the former region; and 70 providers of services within and beyond South West Thames.**

***Results*—Principal reasons for use of services out of the region were accessibility (15) and negative appraisals of local services (14). Three main strategies for dealing with the problems of such use were suggested by providers. These entailed introducing users of services outside the region to services in their locality (16); sharing the responsibility for care between providers in specialist centres and in the person's locality (10); and involving the person's general practitioner in their care (12). These strategies were deemed acceptable by 29, 30, and 20 service users respectively.**

***Conclusion*—The reasons underlying use of services for patients with HIV infection and AIDS outside the region offer suggestions for developing services in areas with a high incidence of such use. The suggestions advanced by service providers offer an acceptable framework for dealing with the problems.**

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Introduction

About two thirds of people with AIDS who live in the area covered by the former South West Thames Regional Health Authority were first reported to the Communicable Disease Surveillance Centre by clinicians outside the region.[1] It seems that people with HIV infection and AIDS resident in this area tend to travel to "centres of excellence" for HIV and AIDS care (chiefly in central London) for services. This leads to certain problems. As the patient's condition deteriorates he or she may no longer be able to travel and may seek treatment from services in their area of residence.[2] The transition to using local services may, however, prove difficult for a person with AIDS who may have become accustomed to receiving coordinated, specialist services at centres of excellence outside the region and who may perceive local services as inferior. Furthermore, in delivering services to patients who have transferred from other centres late in the course of their illness, local providers of services may be treating patients who are already very ill and with whom they have not had the opportunity of establishing a therapeutic relationship over time.

We studied the reasons for use of HIV and AIDS services outside the region among residents with HIV